

scription of layer 117 at page 18, lines 14-30 and layer 217, page 19, lines 7-25). In formulating the rejection, the Examiner states that the rejected claims call for a layer of titanium without tungsten on the semiconductor bridge and that the Martinez-Tovar PCT application describes a layer of titanium (without tungsten therein) on the semiconductor bridge, beneath the tungsten-containing layers.

As argued in the paper filed January 25, 2002, and discussed with the Examiner via telephone on January 10, 2003, the stated ground of rejection was overcome by the paper filed July 6, 2001 in the captioned application, in which claim 1 and claim 18 were amended to state that the layer on top of the semiconductor bridge material "consists essentially of" titanium. As was explained in the January 25th paper, this limitation provides a novel and non-obvious distinction relative to the Martinez-Tovar PCT application because the term "consisting essentially of" is intended to indicate the substantial exclusion of tungsten from the metal layer on the semiconductor material of the bridge.

It is respectfully submitted that the Examiner is misinterpreting the significance of the "consisting essentially of" terminology in the rejected claims. Such a claim limitation is a negative limitation, indicating that the claimed subject matter is defined as much by what is recited in the claim as by what is excluded. Therefore, in advancing a prior art reference as anticipating the claim, it is not sufficient to establish that the reference discloses all the structures positively recited in the claim. Due to the exclusionary nature of the "consisting essentially of" limitation, it is also necessary that an anticipating reference also show the absence of the subject matter excluded by that phrase. In other words, a reference that shows the excluded subject matter does not anticipate the claims. Were this not the case, phrases such as "consisting of" and "consisting essentially of" would be no different from "comprising".

In this case, the cited reference only shows devices in which the metal layer on the semiconductor bridge has tungsten as well as titanium. Therefore, the cited reference fails to teach the exclusion of tungsten on the bridge that constitutes a material limitation of the rejected claims.

As disclosed in the specification of the subject application, the exclusion of tungsten from the layer on the semiconductor bridge gives the claimed device significantly different properties from devices that include tungsten in the layer on the semi-

conductor bridge (see page 3, line 18 through page 4, line 20). In particular, the specification states that the melting point of tungsten is approximately the same as the vaporization temperature of the semiconductor bridge material. For this reason, the tungsten absorbs so much energy from the semiconductor material beneath it that the efficiency of the device is degraded. In contrast, titanium has a melting temperature significantly lower than the vaporization temperature of the semiconductor bridge material. Therefore, the titanium layer melts well before the silicon vaporizes and the molten titanium does not impede the plasma generated from the silicon bridge from igniting the energetic material. For this reason, by employing titanium and excluding tungsten from the layer on the semiconductor bridge material, the resulting invention provides an advantage not recognized in the cited reference, i.e., the claimed device will initiate the reactive material much more reliably than prior art devices.

It will be understood by one of ordinary skill in the art, upon a reading and understanding of the captioned application, that this advantage could be realized by employing any metal having a melting temperature well below the vaporization temperature of the semiconductor material. For this reason, claims 21, 22 and 23 need not be limited to titanium.

Since the Martinez-Tovar PCT application only shows devices having a tungsten layer on the semiconductor bridge, and since it provides no suggestion for omitting the tungsten, this reference cannot properly be said to anticipate claim 1 or claim 18. Accordingly, claims 1, 18 and claims 2-11, 15-18, 19 and 20 dependent therefrom are patentably distinguishable from the Martinez-Tovar PCT application.

Independent claim 12 and claims 13, 14 and 17 dependent therefrom, provide a separate patentable distinction relative to the Martinez-Tovar PCT application by describing a semiconductor bridge igniter made by a particular process, the process involving depositing an exposed layer of titanium (i.e., a layer not covered by another metal) on the semiconductor bridge material and preconditioning the igniter. As described in the application at page 5, lines 1-17, an exposed layer of titanium on a semiconductor device that has not been preconditioned is subject to post-manufacturing variations in resistivity. No exposed layer of titanium and no such changes in resistivity in such a layer were disclosed or suggested in the Martinez-Tovar PCT application, and no preconditioning step as recited in claim 12 was disclosed or suggested therein.

Accordingly, claims 12 and 13, 14, 17, 19 and 20 dependent therefrom all contain a patentable distinction relative to the Martinez-Tovar PCT application.

Independent claim 21 defines a method of operation of a semiconductor bridge igniter, the method including applying a voltage sufficient to melt the metal and vaporize the semiconductor material thereunder. No such method of operation is taught or suggested by the cited reference. In fact, due to the presence of tungsten in the layer on the semiconductor material of the Martinez-Tovar device, the method of claim 21 could not be practiced with that prior art device. As described in the subject application at page 3, lines 18-31, the tungsten used in the metal layer of the semiconductor bridge device shown in the Martinez-Tovar PCT application is not melted by the voltage that causes the vaporization of the silicon thereunder, and the solid metallic tungsten inhibits the transfer of energy from the plasma created by the semiconductor bridge to the energetic material it is supposed to ignite. This clearly indicates that the method of operation of the device shown in that reference does not achieve the step defined in claim 21, i.e., the voltage applied to the bridge does not lead to the melting of the metal thereon. Furthermore, there is no suggestion in the reference towards operating the igniter device in this way and, given the inherent difference in the melting temperature of tungsten (about 3410°C), and the vaporization temperature of the bridge material (about 1412°C), the semiconductor bridge material will vaporize before the tungsten could melt, so it does not appear to be possible for the device shown by the Martinez-Tovar PCT application to operate according to the claimed method.

Claim 22 further defines a method of operation of the Applicants' invention in which the specific properties of the semiconductor bridge material and the metal layer thereon such that the application of current generates temperatures that produce particular relationships between the resistance of the semiconductor material and the metal thereon. As no such relationships appear to be achieved in the Martinez-Tovar PCT application device, claim 22 defines a further patentable distinction relative to the cited reference.

For the reasons discussed above, all of the claims pending in the application define patentable distinctions relative to the cited reference. Accordingly, the stated ground of rejection is respectfully traversed.

Rejection of Claims 8 and 9 Under 35 U.S.C. 103

Claims 8 and 10 stand rejected under 35 U.S.C. 103 as being obvious in view of the Martinez-Tovar PCT application and U.S. Patent 4,976,200 ("Benson et al").

Claims 8 and 10 further define the semiconductor material of the semiconductor bridge igniter defined in claim 1.

Benson et al discloses a tungsten bridge igniter device and provides no teaching or suggestion for the substitution of tungsten by titanium, as taught by the present application and defined in claim 1. Accordingly, the teachings of Benson et al fail to supplement those of the Martinez-Tovar PCT application in a way that would render claim 1, from which claims 8 and 10 depend, obvious. Therefore, claims 8 and 10 depend from a base claim that is not only allowable over the Martinez-Tovar PCT application for reasons set forth above, but which is also non-obvious even in view of the combination of references applied against claims 8 and 10. Therefore, these claims are allowable at least because they depend from an allowable base claim.

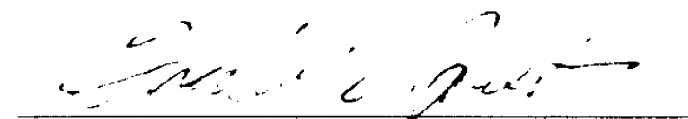
Double-Patenting Rejection

Claims 1-7, 9 and 11-24 of the captioned application stand rejected under the judicially created doctrine of obviousness-type double patenting over claims 1, 3, 4, 5-9, 12-20 and 36 of U.S. Patent 6,133,146 to Martinez-Tovar et al (hereinafter referred to as "the U.S. Martinez-Tovar et al patent"). (It is noted that this patent was granted on the application on which the Martinez-Tovar PCT application is based, and their disclosures of the two applications are substantially the same and the remarks set forth above relative to the Martinez-Tovar PCT application apply equally to the U.S. Martinez-Tovar et al patent.) Claims 1-24 of the captioned application stand rejected on the basis of obviousness-type double patenting over those same claims of the U.S. Martinez-Tovar et al patent, in view of Benson et al.

Each of claims 1-20 and 36 of the U.S. Martinez-Tovar et al patent defines a semiconductor bridge igniter device in which the layer of metal on the semiconductor bridge material comprises tungsten. For reasons set forth above in the remarks addressing the rejections under 35 U.S.C. 102 and 103, neither the U.S. Martinez-Tovar et al patent alone or in combination with Benson et al provide any teaching or suggestion for the substantial elimination of tungsten from the claims of the U.S. Martinez-

Tovar et al patent. Accordingly, the claims of the pending application, which exclude tungsten, are all patentably distinct from the cited claims of the U.S. Martinez-Tovar et al patent because there is no teaching or suggestion in the patent for the exclusion of tungsten from the metal layer on the bridge, as required by claims 1, 12 and 18 of this application. Furthermore, there is no teaching or suggestion towards the manufacture of an igniter device according to the process recited in claim 12, or for the method of operation of such a device as defined in claims 21-24 which cannot be attained with a device having a tungsten layer on the semiconductor bridge. For these reasons, the double-patenting rejection is respectfully traversed.

Respectfully submitted,



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